

FORM PTO-1390 (REV. 1-98)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER 1163-258P
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/424661
INTERNATIONAL APPLICATION NO. PCT/JP98/03661	INTERNATIONAL FILING DATE August 18, 1998	PRIORITY DATE CLAIMED NONE	
TITLE OF INVENTION OBJECT DATA SEARCH APPARATUS, OBJECT DATA SEARCH METHOD AND COMPUTER-READABLE RECORDING MEDIUM STORING DATA			
APPLICANT(S) FOR DO/EO/US MITSUGI, Tatsuya			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).</p> <p>4. <input type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))</p> <p>a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</p> <p>b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau.</p> <p>c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(3)).</p> <p>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(2)).</p> <p>a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</p> <p>b. <input type="checkbox"/> have been transmitted by the International Bureau.</p> <p>c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p>d. <input checked="" type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p>			
Items 11. to 16. below concern document(s) or information included:			
<p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98./-1449 and International Search Report (PCT/ISA/210) W/ 2 References</p> <p>12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>14. <input type="checkbox"/> A substitute specification.</p> <p>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>16. <input checked="" type="checkbox"/> Other items or information: 1.) Seven (7) sheets of Formal Drawings</p>			



U.S. APPLICATION NO (if known, see 37 CFR 1.5) <div style="font-size: 24pt; font-weight: bold;">09/424661</div>		INTERNATIONAL APPLICATION NO PCT/JP98/03661		ATTORNEY'S DOCKET NUMBER 1163-258P	
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47. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. \$970.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$840.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO. \$760.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$670.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4). \$96.00 ENTER APPROPRIATE BASIC FEE AMOUNT =	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left;">CALCULATIONS</th> <th style="text-align: left;">PTO USE ONLY</th> </tr> <tr> <td style="width:50%;"></td> <td style="width:25%;"></td> <td style="width:25%;"></td> </tr> <tr> <td>\$ 840.00</td> <td></td> <td></td> </tr> </table>		CALCULATIONS		PTO USE ONLY				\$ 840.00		
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Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).					
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CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	5 - 20 =	0	X \$18.00	\$ 0	
Independent Claims	3 - 3 =	0	X \$78.00	\$ 0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable) No			+ \$260.00	\$ 0	
TOTAL OF ABOVE CALCULATIONS =				\$ 840.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$	
SUBTOTAL =				\$ 840.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$ 840.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$ 40.00	
TOTAL FEES ENCLOSED =				\$ 880.00	
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				charged	\$


a. ☒ A check in the amount of \$ 880.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account. No. _____ in the amount of \$ _____ to cover the above fees.
 A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
 overpayment to Deposit Account No. 02-2448.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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35,094
 REGISTRATION NUMBER

/dl November 29, 1999

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PATENT
1163-258P

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: MITSUGI, Tatsuya
Int'l. Appl. No.: PCT/JP98/03661
Appl. No.: New Group:
Filed: November 29, 1999 Examiner:
For: OBJECT DATA SEARCH APPARATUS,
OBJECT DATA SEARCH METHOD AND
COMPUTER-READABLE RECORDING MEDIUM
STORING DATA

PRELIMINARY AMENDMENT

BOX PATENT APPLICATION

Assistant Commissioner for Patents
Washington, DC 20231

November 29, 1999

Sir:

The following Preliminary Amendments and Remarks are respectfully submitted in connection with the above-identified application.

AMENDMENTS

IN THE SPECIFICATION:

Please amend the specification as follows:

Before line 1, insert --This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/JP98/03661 which has an International filing date of August 18, 1998, which designated the United States of America.--

REMARKS


The specification has been amended to provide a cross-reference to the previously filed International Application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By


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(Rev. 03/30/99)

OBJECT DATA SEARCH APPARATUS, OBJECT DATA SEARCH
METHOD AND COMPUTER-READABLE RECORDING MEDIUM STORING
DATA

5 TECHNICAL FIELD

The present invention relates to an object data
search apparatus and object data search method for
searching for a plurality of object data items stored
in a database and to a computer-readable recording
10 medium in which data is stored, and, more particularly,
to improvement for efficiently narrowing a search for
object data using a simple search criterion input.

15 BACKGROUND ART

Fig. 1 is a diagram showing a structure of a
database, illustrating a schema (logical structure)
of a database for an object data search apparatus
according to the related art. Referring to Fig. 1,
20 reference numeral 14 indicates destination data
having a name attribute 14a, a latitude attribute 14b,
a longitude attribute 14c and the like of a destination.
Numeral 19 indicates search data having a location
attribute 19a, a keyword attribute 19b and a text
25 attribute 19c. A tuple for each destination is
comprised of attribute words related to these
attributes.

In the illustrated example, the location

attribute 19a of "parking lot", the keyword attribute 19b of "close to station" and the text attribute 19c of "accommodates 30 cars" are associated with the destination data having the name attribute 14a of "ABC". Also, the location attribute 19a of "restaurant", the keyword attribute 19b of "specializes in French cuisine" and the text attribute 19c of "directly operated by ***" are associated with the destination data having the name attribute 14a of "DEF".

A description will now be given of the operation.

When a search word is input to a database management system (DBMS) (not shown) coupled to the database, the DBMS searches the database based on the search word. More specifically, when the search word is related to the location attribute 19a, for example, the search is conducted based on the location attribute 19a based on the search word, so as to retrieve a tuple associated with an attribute word that matches the search word. The destination data for the retrieved tuple is output as search result.

Since the object data search apparatus according to the related art is constructed as described above, a search can only be conducted based on the attribute word associated with "object of action" categories such as the location attribute 19a, the keyword attribute 19b and the text attribute 19c.

Accordingly, when narrowing a search in the

search word categorization structure as described above using a plurality of search words, the search word should be input one by one. Alternatively, an advanced search criterion provided for each object data search apparatus may be used to relate a plurality of search words to each other to conduct a search. Particularly, when a search for destination facility as mentioned is conducted by radio in a car navigation system, the aforementioned deficiency in the search narrowing capability presents a serious problem when the system is poorly constructed or when the data transfer rate in the communication channel is relatively low.

In a known approach according to the related art for conducting a search using a simple search criterion input; i.e., without using an advanced search criterion, search words associated with the destination data (object data) are classified hierarchically. The hierarchy is sequentially selected top down until the target object data is identified. In such an approach, however, the hierarchy should always be selected top down. For each selection, a large quantity of data may be transferred over a communication channel that may have a low data transfer rate. For this reason, this kind of approach is not suitably used in a car navigation system.

The present invention has been developed in order

to resolve the aforementioned problems and has an object of providing an object data search apparatus, object data search method and a computer-readable recording medium storing data, capable of efficiently
5 narrowing a search for object data and suitable for use in a car navigation system or the like.

DISCLOSURE OF THE INVENTION

The present invention provides an object data
10 search apparatus comprising: a database for storing object data in association with a plurality of attribute words categorized according to sentence elements of a natural language; an input unit for receiving an input of a search criterion in the form
15 of a sentence of the natural language; a criterion retrieval unit for analyzing the search criterion in the form of the sentence and retrieving one of a plurality of search words respectively corresponding to sentence element categories of the natural
20 language; an object retrieval unit for searching the database using each of the search words respectively associated with the sentence element categories, and retrieving the object data associated with the attribute words that match the a single search word
25 or the plurality of search words; and an output apparatus for outputting the object data thus retrieved.

The object data search apparatus comprises: a

database for storing object data in association with a plurality of attribute words categorized according to sentence elements of a natural language; an input unit for receiving an input of a search criterion in the form of a sentence of the natural language; a criterion retrieval unit for analyzing the search criterion in the form of the sentence and retrieving one of a plurality of search words respectively corresponding to sentence element categories of the natural language; an object retrieval unit for searching the database using each of the search words respectively associated with the sentence element categories, and retrieving the object data associated with the attribute words that match the single search word or the plurality of search words; and an output apparatus for outputting the object data thus retrieved. Therefore, by inputting the search criterion using a natural language, a complex search criterion including a plurality of search words can be input for a search. Accordingly, it is easy for even an inexperienced person to input a complex search criterion. Moreover, narrowing of a search for destination data can be efficiently conducted with the complex search criterion.

25 The database stores destination data at least associated with an attribute word having an agent of action category, an attribute word having an action category and an attribute word having an object of

action category.

Since the database stores destination data at least associated with an attribute word having an agent of action category, an attribute word having an action category and an attribute word having an object of action category, it is possible to efficiently narrow a search for a destination data by inputting the number of people, category of people, type of action and object of action using a sentence format of a natural language.

The present invention provides an object data search method comprising the steps of: retrieving a single search word or a plurality of search words from a search criterion input in the form of a sentence of a natural language by analyzing the search criterion in accordance with a grammar of the natural language; conducting a search relative to a plurality of sentence element categories associated with a plurality of object data items, based on the single search word or the plurality of search words; and retrieving the object data associated with the attribute word that matches the single search word or the plurality of search words and outputting the object data thus retrieved.

An object data search method according to the invention comprises the steps of: retrieving a single search word or a plurality of search words from a search criterion input in the form of a sentence of a natural

language by analyzing the search criterion in
accordance with a grammar of the natural language;
conducting a search relative to a plurality of
sentence element categories associated with a
5 plurality of object data items, based on the single
search word or the plurality of search words; and
retrieving the object data associated with the
attribute word that matches the single search word or
the plurality of search words and outputting the
10 object data thus retrieved. Therefore, by inputting
the search criterion using a natural language, a
complex search criterion including a plurality of
search words can be input for a search. Accordingly,
it is easy for even an inexperienced person to input
15 a complex search criterion. Moreover, narrowing of
a search for destination data can be efficiently
conducted with the complex search criterion.

The search according to the invention is
conducted using at least a search word having an agent
20 of action category, a search word having an action
category and a search word having an object of action
category.

Since the search according to the invention is
conducted using at least a search word having an agent
25 of action category, a search word having an action
category and a search word having an object of action
category, it is possible to efficiently narrow a
search for a destination data by inputting the number

of people, category of people, type of action and object of action using a sentence format of a natural language.

The computer-readable recording medium
 5 according to the invention stores data according to a relational database structure, wherein tuples each comprising an object data item and a plurality of attribute words categorized according to sentence elements of a natural language are stored.

10 Since the tuples each comprising an object data item and a plurality of attribute words categorized according to sentence elements of a natural language are stored, a complex search criterion including a plurality of search words can be input for a search,
 15 by inputting the search criterion using a natural language. Accordingly, it is easy for even an inexperienced person to input a complex search criterion. Moreover, narrowing of a search for destination data can be efficiently conducted with the
 20 complex search criterion.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram showing a structure of a database, illustrating an example of a schema (logical
 25 structure) of a database according to the related art;

Fig. 2 is a block diagram showing a structure of an object database search apparatus according to a first embodiment of the present invention;

Fig. 3 is a flowchart showing a search criterion generation process by a central processing unit according to the first embodiment;

Fig. 4 is a flowchart showing a search process
5 by a DBMS according to the first embodiment;

Fig. 5 is a flowchart showing a search result display process by the central processing unit according to the first embodiment;

Fig. 6 is a diagram showing a structure of a
10 database, illustrating an example of schema (logical structure) of a database according to the first embodiment;

Fig. 7 is a flowchart showing a process starting with input of voice and ending with display of a search
15 result according to the first embodiment;

Fig. 8 is a block diagram showing a structure of an object data search apparatus according to a second embodiment of the present invention; and

Fig. 9 is a flowchart showing a search process
20 by the central processing unit based on a voice signal according to the second embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

The present invention will be described in terms
25 of the best mode for carrying out the invention with reference to the accompanying drawings.

First Embodiment

Fig. 2 is a block diagram showing a structure of

an object database search apparatus according to a first embodiment of the present invention. The database shown in Fig. 2 has a database structure for use in a car navigation system for searching for and supplying information related to various facilities. Referring to Fig. 2, reference numeral 1 indicates a car navigation system, 2 indicates a navigation server supplied with information related to various facilities from the facilities via a telephone line or the like, storing the supplied information, and connected to the car navigation system 1 via a portable phone (telephone line) or the like to enable search for and supply of the information related to the facilities. Numeral 3 indicates a database storing destination data and the like according to the relational database structure; 4 indicates a voice input unit for outputting a voice signal responsive to voice input; 5 indicates GPS (Global Positioning System) for outputting location information determined based on a satellite wave; 6 indicates a central processing unit receiving the voice signal, the location information and the like, and generating display information; 7 indicates a CD-ROM drive for reading data from a CD-ROM storing map data and the like; 8 indicates a memory such as a D-RAM for temporarily storing various data; 9 indicates a display unit such as a CRT display device, liquid crystal display device, plasma display device or the

like for displaying the display information; 10 indicates a wireless terminal unit for wireless communication; 11 indicates a wireless host unit for wireless communication with the wireless terminal unit; 12 indicates a database management system (DBMS) for managing the database 3 and conducting a search; 13 indicates a data input unit for writing data to the database 3 via the DBMS 12.

A DVD-ROM drive may be used in place of the CD-ROM drive. The wireless host unit 11 may not be directly connected to the wireless terminal unit 10 by radio. Connection may be established via a telephone line or a Web page on the Internet.

A description will now be given of the operation.

Fig. 3 is a flowchart showing a search criterion generation process by the central processing unit 6 according to the first embodiment. Referring to Fig. 3, step ST1 is a criterion retrieval step where the voice signal from the voice input unit 4 is analyzed in accordance with a sentence grammar of a natural language and a single search word or a plurality of search words corresponding to sentence element categories of the natural language are retrieved. Step ST2 is a step for generation transmission of data where the single search word or the plurality of search words thus retrieved are superimposed on a predetermined transmission data format so that the data is output to the wireless terminal unit 10.

Fig. 4 is a flowchart showing a search process by the DBMS 12 according to the first embodiment. Referring to Fig. 4, ST3 is a search step where the database 3 is searched based on the single search word or the plurality of search words included in the data received from the wireless host unit 11. Step ST4 is a return data generation step where the single data item or a plurality of destination data items obtained as the search results are superimposed on a predetermined return data format so that the return data is output to the wireless host unit 11.

Fig. 5 is a flowchart showing a search result display process by the central processing unit 6 according to the first embodiment. Referring to Fig. 5, step ST5 is an output data generation step for generating display data based on the one or the plurality of destination data items included in the received data output from the wireless terminal unit 10.

A description will now be given of the relational database structure and a method for searching same according to the first embodiment.

Fig. 6 is a diagram showing a structure of a database, illustrating an example of schema (logical structure) of the database 3 according to the first embodiment. Referring to Fig. 6, reference numeral 14 indicates destination data (object data) having attributes such as the name attribute 14a, the

latitude attribute 14b, the longitude attribute 14c of a destination. Numeral 15 indicates search data having an S attribute 15a (agent of an action category), a V attribute 15b (action category), an O attribute 15c (object of action category), a C attribute 15d (object of action category) and a keyword attribute 15e and a text attribute 15f. A tuple for each destination is comprised of attribute words related to these attributes.

10 In the illustrated example, the S attribute 15a of "large vehicle", the V attribute 15b of "park", the O attribute 15c of "parking lot", the C attribute 15d of "roofed", the keyword attribute 15e of "close to station" and the text attribute 15f of "accommodates
15 30 cars" are associated with the destination data item having the name attribute 14a of "ABC". The S attribute 15a of "family", the V attribute 15b of "eat", the O attribute 15c of "restaurant", the C attribute 15d of "top floor", the keyword attribute 15e of
20 "specializes in French cuisine" and the text attribute 15f of "directly operated by ***" are associated with the destination data item having the name attribute 14a of "DEF".

Fig. 7 is a flowchart showing a process starting
25 with input of voice and ending with display of a search result according to the first embodiment. Referring to Fig. 7, step ST6 is an S retrieval step for analyzing the voice signal in accordance with the sentence

grammar of the natural language and retrieving search words corresponding to the S attribute 15a Step ST7 is a V retrieval step for analyzing the voice signal in accordance with the sentence grammar of the natural language and retrieving search words corresponding to the V attribute 15b. Step ST8 is an O retrieval step in which the voice signal is analyzed in accordance with the sentence grammar of the natural language so that search words corresponding to the O attribute 15c are retrieved. Step ST9 is a C retrieval step in which the voice signal is analyzed in accordance with the sentence grammar of the natural language so that search words corresponding to the C attribute 15d are retrieved. Step ST10 is a keyword retrieval step in which the voice signal is analyzed in accordance with the sentence grammar of the natural language so that search words corresponding to the keyword attribute 15e are retrieved.

Step ST11 is a S search step in which the S attribute in the database is searched based on the search word corresponding to the S attribute 15a so as to retrieve a tuple associated with the attribute word that matches the search word. Step ST12 is a V search step in which the V attribute is searched based on the search word corresponding to the V attribute 15b so as to retrieve a tuple associated with the attribute word that matches the search word. Step ST13 is an O search step in which the O attribute is

searched based on the search word corresponding to the O attribute 15c so as to retrieve a tuple associated with the attribute word that matches the search word. Step ST14 is a C search step in which the C attribute

5 is searched based on the search word corresponding to the C attribute 15d so as to retrieve a tuple associated with the attribute word that matches the search word. Step ST15 is a keyword search step in which the keyword attribute is searched based on the search word

10 corresponding to the keyword attribute 15e so as to retrieve a tuple associated with the attribute word that matches the search word. Step ST16 is a filtering step in which a plurality of tuples retrieved in the above search steps (ST11-ST15) are subject to

15 filtering such that overlapping tuples are filtered off, and filtering for attribute relation based on the grammatical structure of the natural language is performed. The destination data for the tuple thus retrieved is output as a search result. Step ST17 is

20 a step for displaying the search result.

As described above, according to the first embodiment, the destination data 14 is associated with a plurality of attribute words respectively belonging to the S attribute 15a, the V attribute 15b, the O

25 attribute 15c and the C attribute 15d so that the destination data 14 is stored in the database 3 according to the relational database structure. A search criterion is input using a natural language so

that search words corresponding to the S attribute 15a, the V attribute 15b, the O attribute 15c and the C attribute 15d are retrieved from the input information. The retrieved search words are used to search for the destination data 14. By inputting the search criterion using a natural language, a complex search criterion including a plurality of search words can be input for a search. Accordingly, it is easy for even an inexperienced person to input a complex search criterion. Moreover, narrowing of a search for destination data can be efficiently conducted with the complex search criterion.

Second Embodiment

Fig. 8 is a block diagram showing a structure of an object data search apparatus according to a second embodiment of the present invention. Referring to Fig. 8, reference numeral 16 indicates a CD-ROM in which the destination data 14 and the like are stored according to the relational database structure like that of the first embodiment. Numeral 17 indicates a CD-ROM drive for reading data from the CD-ROM 16. Numeral 18 indicates a central processing unit for conducting a search based on the voice signal, location information and the like so as to generate display information and the like. The other aspects of the construction are the same as the corresponding aspects of the first embodiment. Like numerals

represent like components and the description thereof is omitted.

A description will now be given of the operation.

Fig. 9 is a flowchart showing a search process
5 by the central processing unit 18 based on a voice signal according to the second embodiment. The steps disclosed herein are the same as the corresponding steps of the first embodiment. Like numerals
represent like components and the description thereof
10 is omitted.

According to the second embodiment, the destination data 14 is associated with a plurality of attribute words respectively belonging to the S attribute 15a, the V attribute 15b, the O attribute
15 15c and the C attribute 15d so that the destination data 14 is stored in the CD-ROM 16 according to the relational database structure. A search criterion is input using a natural language so that search words corresponding to the S attribute 15a, the V attribute
20 15b, the O attribute 15c and the C attribute 15d are retrieved from the input information. The retrieved search words are used to search for the destination data 14. By inputting the search criterion using a natural language, a complex search criterion
25 including a plurality of search words can be input for a search. Accordingly, it is easy for even an inexperienced person to input a complex search criterion. Moreover, narrowing of a search for the

destination data 14 can be efficiently conducted with the complex search criterion.

In the foregoing embodiments, only those examples with a sentence structure of SVOC are given.

5 However, the present invention may also be applied to sentence structures such as SV and SVCC.

In the foregoing embodiments, it is assumed that the present invention is used in a car navigation system. The present invention may also be used as a
10 data search apparatus provided at an information provider center providing information via a portable telephone.

When the voice recognition partially fails in the foregoing embodiments, a user may be prompted for only
15 those elements of SVOC producing a failure in recognition.

In the foregoing embodiments, the navigation server 2 for storing, searching for and providing database information is provided so as to be separate
20 from the navigation system. Alternatively, the navigation server may be built in the car navigation system. In this case, a CD-ROM or a DVD-ROM may be used as a database.

25 INDUSTRIAL APPLICABILITY

As described above, the object data search apparatus, the object data search method and the computer-readable recording medium storing data

according to the invention enables efficient narrowing of object data search using a simple search criterion input and is therefore suitable for voice input search in a car navigation system or the like.

CLAIMS:

1. An object data search apparatus comprising:
5 a database for storing object data in association with a plurality of attribute words categorized according to sentence elements of a natural language;
an input unit for receiving an input of a search criterion in the form of a sentence of the natural
10 language;
a criterion retrieval unit for analyzing the search criterion in the form of the sentence and retrieving one of a plurality of search words respectively corresponding to sentence element
15 categories of the natural language ;
an object retrieval unit for searching the database using each of the search words respectively associated with the sentence element categories, and retrieving the object data associated with the
20 attribute words that match a single search word or a plurality of search words; and
an output apparatus for outputting the object data thus retrieved.

2. The object data search apparatus according to
25 claim 1, wherein said database stores destination data at least associated with an attribute word having an agent of action category, an attribute word having an action category and an attribute word having an object

of action category.

3. An object data search method comprising the steps of:

retrieving one or a plurality of search words
5 from a search criterion input in the form of a sentence
of a natural language by analyzing the search
criterion in accordance with a grammar of the natural
language;

conducting a search relative to a plurality of
10 sentence element categories associated with a
plurality of object data items, based on a single
search word or a plurality of search words; and

retrieving the object data associated with the
attribute word that matches a single search word or
15 a plurality of search words and outputting the object
data thus retrieved.

4. The object data search method according to
claim 3, wherein the search is conducted using at least
a search word having an agent of action category, a
20 search word having an action category and a search word
having an object of action category.

5. A computer-readable recording medium storing
data according to a relational database structure,
wherein tuples each comprising an object data item and
25 a plurality of attribute words categorized according
to sentence elements of a natural language are stored.

ABSTRACT

Object data is stored in association with a plurality of attribute words categorized according to sentence elements of a natural language, and an object
5 data search is efficiently narrowed using a simple search criterion input.

FIG.1

14			19			
14a		14b	14c	19a	19b	19c
NAME		LATITUDE	LONGITUDE	LOCATION	KEYWORD	TEXT
1	ABC	LAT.35°30'26.32"N	LONG.135°25'45.33"E	PARKING LOT	CLOSE TO STATION	ACCOMMODATES 30 CARS
2	DEF	LAT.35°30'40.23"N	LONG.135°30'45.33"E	RESTAURANT	SPECIALIZES IN FRENCH CUISINE	DIRECTLY OPERATED BY ***
.

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FIG. 2

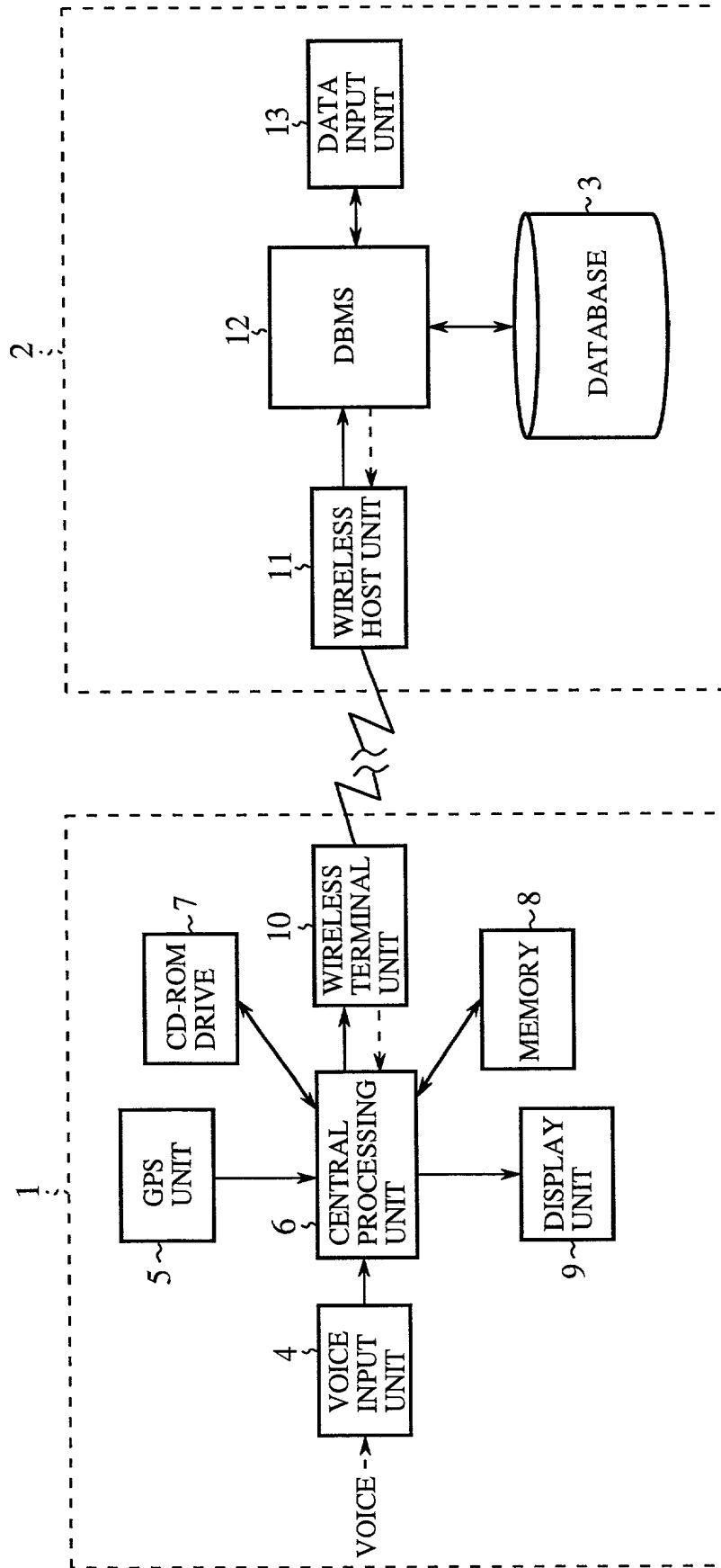


FIG.3

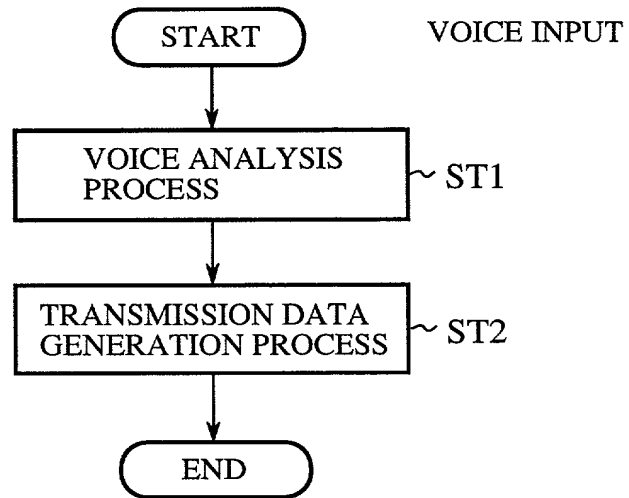
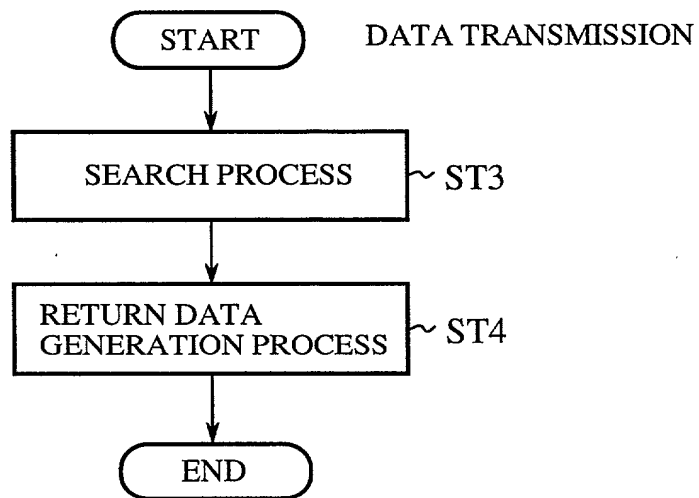


FIG.4



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FIG.5

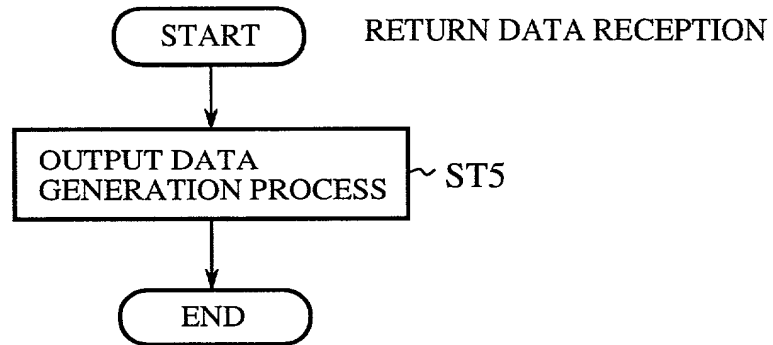


FIG.9

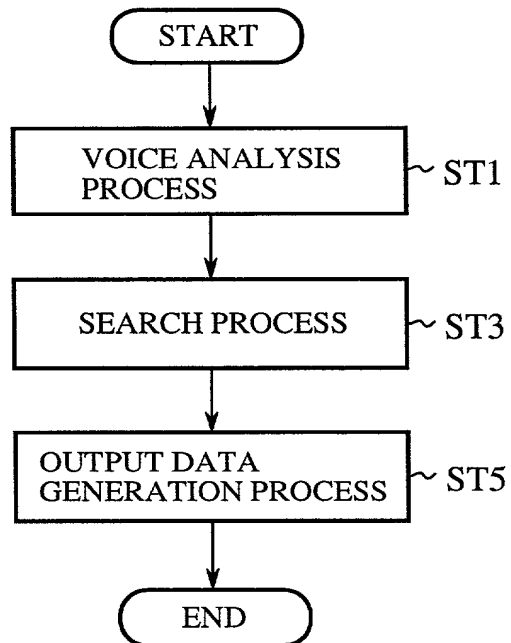


FIG. 6

[illegible]

FIG.7

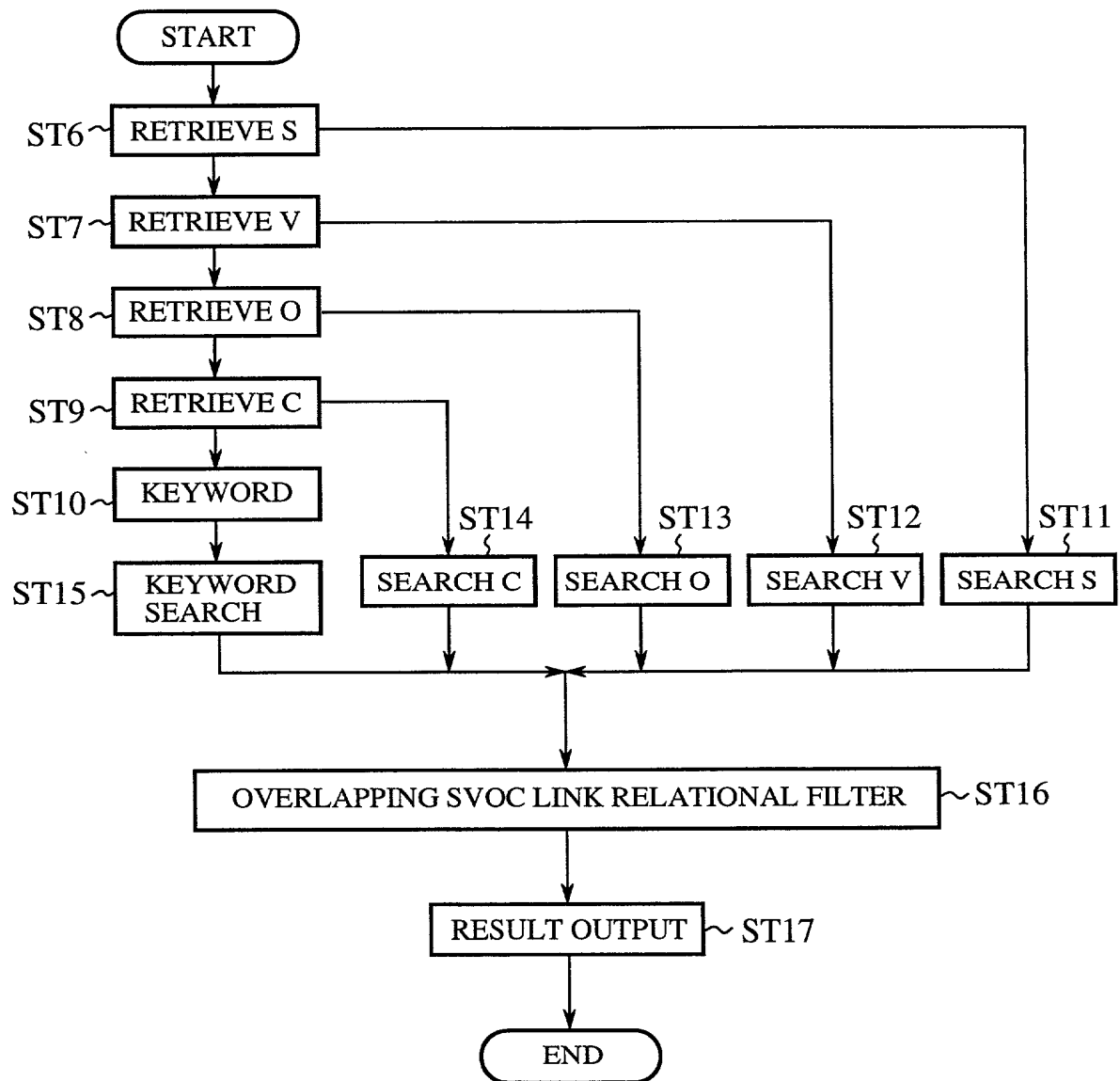
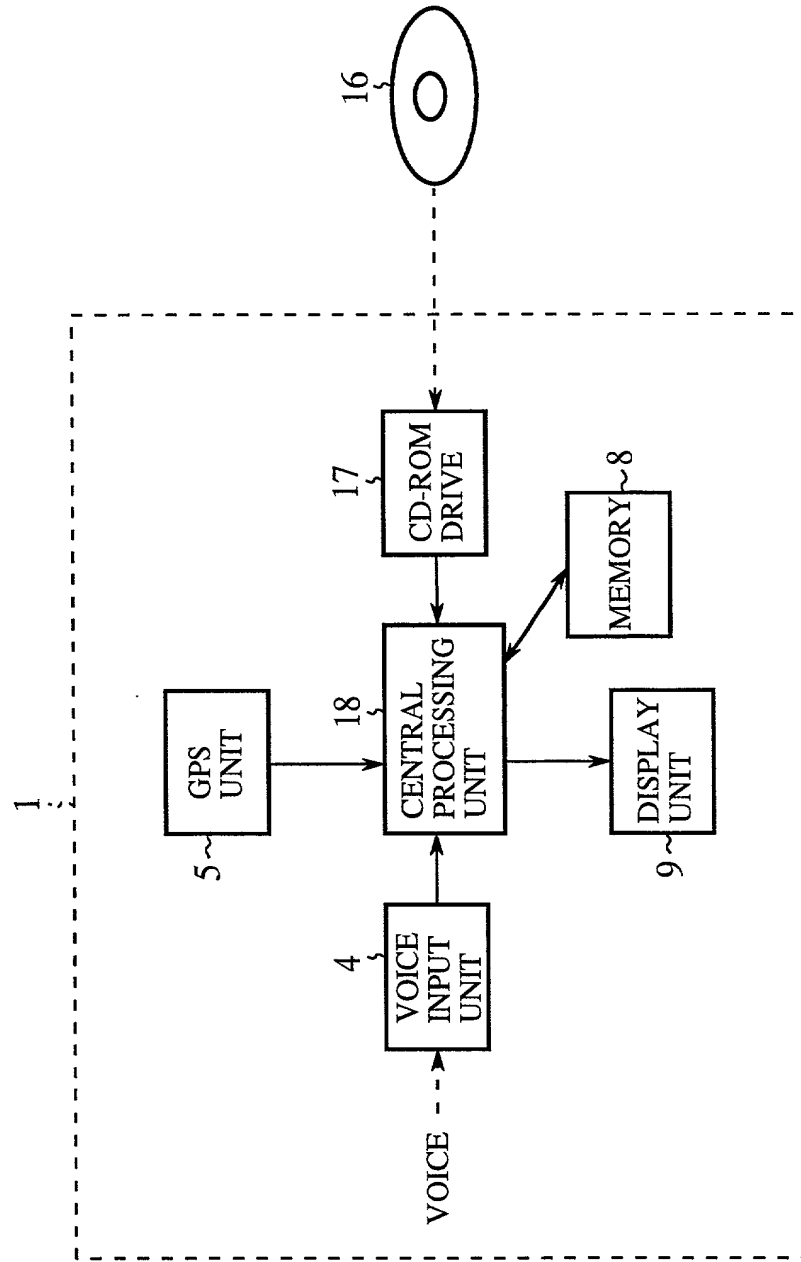


FIG.8



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Declaration and Power of Attorney For Patent Application

特許出願宣言書及び委任状

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日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

As a below named inventor, I hereby declare that:

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

My residence, post office address and citizenship are as stated next to my name.

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者であると（下記の名称が複数の場合）信じています。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

"OBJECT DATA SEARCH APPARATUS, OBJECT DATA

SEARCH METHOD AND COMPUTER-READABLE

RECORDING MEDIUM STORING DATA"

上記発明の明細書（下記の欄でx印がついていない場合は、本書に添付）は、

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☒ was filed on August 18, 1998
 as United States Application Number or
 PCT International Application Number
PCT/JP98/03661 and was amended on
 _____ (if applicable).

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Prior Foreign Application(s)

外国での先行出願

(Number) (番号)	(Country) (国名)
(Number) (番号)	(Country) (国名)

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(Application No.) (出願番号)	(Filing Date) (出願日)
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(Application No.) (出願番号)	(Filing Date) (出願日)

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Priority Not Claimed

優先権主張なし

(Day/Month/Year Filed) (出願年月日)	<input type="checkbox"/>
(Day/Month/Year Filed) (出願年月日)	<input type="checkbox"/>

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(Status: Patented, Pending, Abandoned) (現況: 特許許可済、係属中、放棄済)

(Status: Patented, Pending, Abandoned) (現況: 特許許可済、係属中、放棄済)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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